

Title: The "Heart" of the Problem

Link to Outcomes:

- **Problem Solving** Working in cooperative learning groups, students will solve problems that require the use of fractions, decimals, and percents. This will include problems with open-ended answers.
- **Communication** Students will demonstrate their ability to communicate mathematically through reading charts, writing results, and class discussion.
- **Reasoning** Students will reason mathematically by gathering evidence from labels/charts, making conjectures, and drawing conclusions from their calculations.
- **Connections** Students will make connections with the topics of nutrition and exercise through reading, field investigations and calculations. They will also connect to English through writing and keeping a journal.
- **Arithmetic Operations** Students will use basic math operations to solve problems that involve time.
- **Number Relationships** Students will be asked to make comparisons of integers, decimals, and percents.
- **Measurement** Students will use stopwatches to measure time and determine heart rate by counting heart beats for 10 seconds and multiplying by six
- **Statistics** Students will measure heart rates and find the average for the entire class.
- **Nature of Science** Students will conduct a field investigation, gather data, and draw conclusions based on their findings.
- **Habits of Mind** Students will be asked to make decisions and design a diet/exercise plan based on their data collection.

Brief Overview:

This activity integrates the use of operations with decimals, percents, and fractions with knowledge of nutrition, the circulatory system, heart rate, and pulse rate. Students will experiment with aerobic and anaerobic exercises to determine an exercise and nutrition program. For a conclusion, students will present fitness and nutrition programs to gain, maintain, and lose weight.

Grade/Level:

Grades 7-9

Duration/Length:

This activity should take 5 to 7 class periods.

Prerequisite Knowledge:

- Students should be able to add, subtract, multiply, and divide decimals and percents.
- Students should be able to convert decimals to percents.

Objectives:

- Calculate fat content, percentage of calories from fat determined by food label, and calories.
- Find resting heart rate, maximum heart rate, and calculate target heart rate.
- Determine difference between aerobic and anaerobic exercise.
- Produce culminating activity to include skills learned throughout the week.

Materials/Resources/Printed Materials:**Material per group of four**

- Food Pyramid
- Nutrition Labels from food students eat in the course of a week
- Calorie Counting Book
- List of Exercises and calories burned per exercise
- Jump Rope
- Hand Weights
- Handouts
- Timer (watch or clock with second hand)
- Aerobic Heart Rate chart
- Poster board Construction paper
- Pencils
- Paper
- Folders
- Any other display material
- 3x5 Cards
- Markers
- Select food items if field trip not an option

Development/Procedures:**Day 1**

- Hand out list of ten food items to students. List can be created by teacher, student or copied from list provided.
- Have students rank the ten food items in order of what they think is lowest in fat (1) to highest in fat (10).
- Take students to a grocery store and have them find the particular food items on the list. Have students read labels and rank the foods by their actual fat content from lowest (1) to highest (10). If a field trip to a grocery store is not possible, have actual food items available in the room, or have students research at the grocery store for homework.
- Compare and discuss perceptions vs. actual results. Follow this by a discussion of calories and fat content to begin the nutrition section of the unit.

Day 2

- Give information on nutrition. Include food pyramid (for meal planning) and a discussion of food groups (i.e., carbohydrates, fat, protein). Discuss with students the relationship between calories burned and weight loss.
- Have students use the labels they have been collecting from foods eaten every day for a week to calculate their daily intake of calories and percent of calories from fat. If food was homemade, a calorie book should be available for approximation.
- Have students record caloric intake on worksheet 1 and fat content on worksheet 2.
- Discuss results of calorie and fat intake and the relationship to healthy diet.

Days 3/4

- Have students find pulse on wrist or neck, count beats for ten seconds, and calculate beats per minute by multiplying the 10 second count by 6.
- Record results on board and on their group worksheet 3. Determine the average pulse rate for the class.
- Discuss average and reasons for low pulse rate.
- Brainstorm (as a class) reasons for high pulse rate.
- Discuss maximum heart rate. Give equation to determine maximum individual heart rate. $(220 - \text{age})$.
- Explain the difference between maximum heart rate and target heart rate. Give formula for the target heart rate (.75 to .85 times maximum heart rate). Explain that to burn calories you must maintain the target heart rate for 20 minutes.
- As homework, have students, measure their resting heart rate when they wake up the next day.

Days 5/6

- Have students determine through experimentation what would be considered aerobic or anaerobic exercise (i.e., jogging = aerobic, weight lifting = anaerobic).
- Check beginning Heart Rate. Have each student in group do a different exercise for 10 minutes. Measure ending heart rate. Determine what percentage of the target heart rate the ending heart rate is. Example:
 - Student A lifts weights while student B times.
 - Student C runs laps or jumps ropes while student D times.
 - Students reverse roles for B and D to exercise and A and C to time.

- Repeat procedure so that all students time twice, do one aerobic exercise and one anaerobic exercise. Example:

Session	A	B	C	D
1	aerobic	time	anaerobic	time
2	time	aerobic	time	anaerobic
3	anaerobic	time	aerobic	time
4	time	anaerobic	time	aerobic

- Have students record individual data on worksheet 4.
- Have students discuss results and relate percent to efficiency of each type of exercise.

Days 7/8

- Have students present culminating project which includes:
 1. a brief analysis of the week's activities
 2. a determination of goal (i.e. weight gain, loss, or maintenance)
 3. a meal plan according to their choice with consideration given to number of calories, percent of calories from fat (less than 30% per day) and food groups represented.
 4. an exercise plan to lose weight (aerobic), gain weight (anaerobic) or maintain weight (combination).

Evaluation:

Students will be evaluated based on the following criteria:

Group participation and daily performance check for individual participation, accountability in assigned roles, and on-task behaviors.

Would the students' chosen exercise and nutrition program achieve the desired goal?

Does the data collected fall within a realistic range for their age group?

Are student calculations correct?

Writing activity - check for adherence to writing standards which includes form, topic, and purpose. Also check for the proper use of mathematical and scientific reasoning and language.

Extension/Follow Up:

Research saturated and unsaturated fat.

Research on FDA labels and regulations.

Research family history on blood pressure and heart disease. Relate exercise and nutrition programs to the prevention of problems in these two areas.

Eating disorders program.

Dieting program with speakers from various weight loss centers.

Athletes performing experiments to compare individuals in top shape with students that may not be in shape.

Create fitness chart for teens.

Graph results of weight loss or weight gain.

Graph heart rate vs. exercise done.

Keep a journal of progress if staying on plan.

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FOOD LIST

*Choose 10 of the following

Dannon Yogurt
Potato Chips
Ground Beef (1/4 lb.)
Macadamia Nuts
McDonald's Shakes
Peanut Butter
Spaghetti Sauce
Bran Muffin
Bagel
Ritz Crackers
Popcorn (air popped and Microwave)
M&M's
Chicken Breast (1)
Peanut Butter
Corn flakes
Smoked Salmon (1 filet)
Chocolate Cupcake
2% milk(8 oz. glass)
Frozen Yogurt
Wheatables
Fig Newtons

Worksheet 1

Total Calorie Intake for One Day

Food eaten	Calories per serving	No. of servings	Total Calories Consumed*
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TOTAL INTAKE OF CALORIES: _____

* Number of calories per serving x Number of servings

Worksheet 2

Percentage of Fat Worksheet

Food Eaten

Number of Calories from Fat

a) Total Number of Calories from Fat: _____

b) Total Number of Calories (Worksheet 1): _____

c) Percentage of Calories from Fat $[(a/b) \times 100]$: _____

Worksheet 3

Heart Rate

- Find your pulse -- either in your wrist or your neck.
- Count the number of heartbeats in 10 seconds. Record this data in column 2.
- Multiply number in column two by 6 to calculate the number of beats per minute. Record this data in column 3.
- Put the number in column three on the board. Record the class data underneath your own in columns 2 and 3.
- Determine the class average by adding the numbers in column 3 and dividing by the number of students in the class.

[illegible]

Average heart rate for the class: _____

Worksheet 4

Exercise Worksheet

- a) Calculate your maximum heart rate (HR) by applying the formula: $220 - (\text{your age})$.
- b) Calculate the range for your target heart rate by the formula : $0.75 \times \text{maximum HR}$ for the lower end of your range. Use the formula : $0.8 \times \text{maximum HR}$ for the upper end of your range. For the target heart rate, choose the value in the middle of your range.
- c) Record your beginning heart rate (BHR) in the space provided below.
- d) Exercise for 10 minutes-- either aerobic or anaerobic, you will do both eventually.
- e) Measure your ending heart rate (EHR) IMMEDIATELY! Record the value in the space provided below. BOTH BHR AND EHR SHOULD BE RECORDED IN BEATS PER MINUTE.
- f) Determine the percentage of target heart rate you achieved by using the following formula: $(\text{EHR} / \text{TARGET HEART RATE}) \times 100$. Do this for both aerobic and anaerobic exercise.

REMEMBER: TO GET BEATS/MINUTE, MEASURE YOUR PULSE FOR 10 SECONDS, THEN MULTIPLY THAT VALUE BY 6.

MAXIMUM HEART RATE: _____

TARGET HEART RATE RANGE: _____

BHR (pre-aerobic): _____ EHR (aerobic): _____

BHR (pre-anaerobic): _____ EHR(anaerobic): _____

% TARGET HEART RATE ACHIEVED (aerobic): _____

% TARGET HEART RATE ACHIEVED (anaerobic): _____